GLPS1502C Power Sypply

(This guide was written by Jos Verstraten on 04-03-2020)

Introduction to the GLPS1502C from Geti
he GLPS1502C is one of the cheapest linear power supply you can buy. With its voltage up to 15 V and current up to 2 A, this power supply is an excellent entry-level model for the hobbyist.
The Geti GLPS1502C is an adjustable laboratory power supply with a voltage range from 0.0 V to 15.0 V that can deliver a maximum current of 2.0 A. The power supply works according to the 'old-fashioned' principle of linear control.
Most modern laboratory power supplies work switched according to the buck-principle or the pwm-principle. Both systems work in switched-mode, where the high unstabilized DC voltage at the input of the control system is chopped into narrow sections by a fast semiconductor switch. The narrower the sections, the lower the output voltage. The result is smoothed. Both systems work very efficiently, little power is lost in the power supply. However, the disadvantage of both systems is that a lot of residual switching frequency appears on the output.
You don't have that problem with a linear power supply. It does not switch, but uses a transistor as a variable resistor between the unstabilized input voltage and the output of the power supply. The linear control has the advantage that there is a (***in theory***) absolutely pure DC voltage on the output.

The appearance of the GLPS1502C
The power supply comes in a sturdy metal housing measuring 22.5 cm deep, 15.0 cm high and 9.5 cm wide. The front of the housing is made of plastic and contains two single-turn potentiometers for adjusting the output voltage and the output current, two LEDs, two three digit digital LCD meters, an on/off switch and two 4 mm connectors. As can be seen in the picture below, the two digital meters have a nice green backlight when the power supply is switched on. It is a pity that the viewing angle of the LCD's is not very large. If you look at the power supply at a not even sharp angle, the segments of the displays will fade.
The green LED lights up when the power supply provides a constant voltage, the red LED lights up when a constant current is available.
With its 2.015 kg, the device is certainly not a lightweight. This is a logical consequence of the linear operating principle that requires a heavy 50 Hz transformer and a heavy heatsink. This heatsink takes up almost the entire back of the housing. Under the heatsink is a fuse holder and the cable entry for the thick power cable with a length of just over one meter. This cable ends in a sturdy earthed mains plug.
Besides the power supply, two small cables are supplied with banana plugs on one side and crocodile clips on the other side. A short manual in English, Czech and Polish is also included.



The appearance of the GLPS1502C.

Note
It should be noted that the earth of the mains plug is connected to the metal housing, but not to the

black 4 mm connector. A lot of power supplies have a third output connector which is connected to chassis and with which you can earth the positive or negative output by means of a metal clamp. With this power supply you have to do this with a cable.

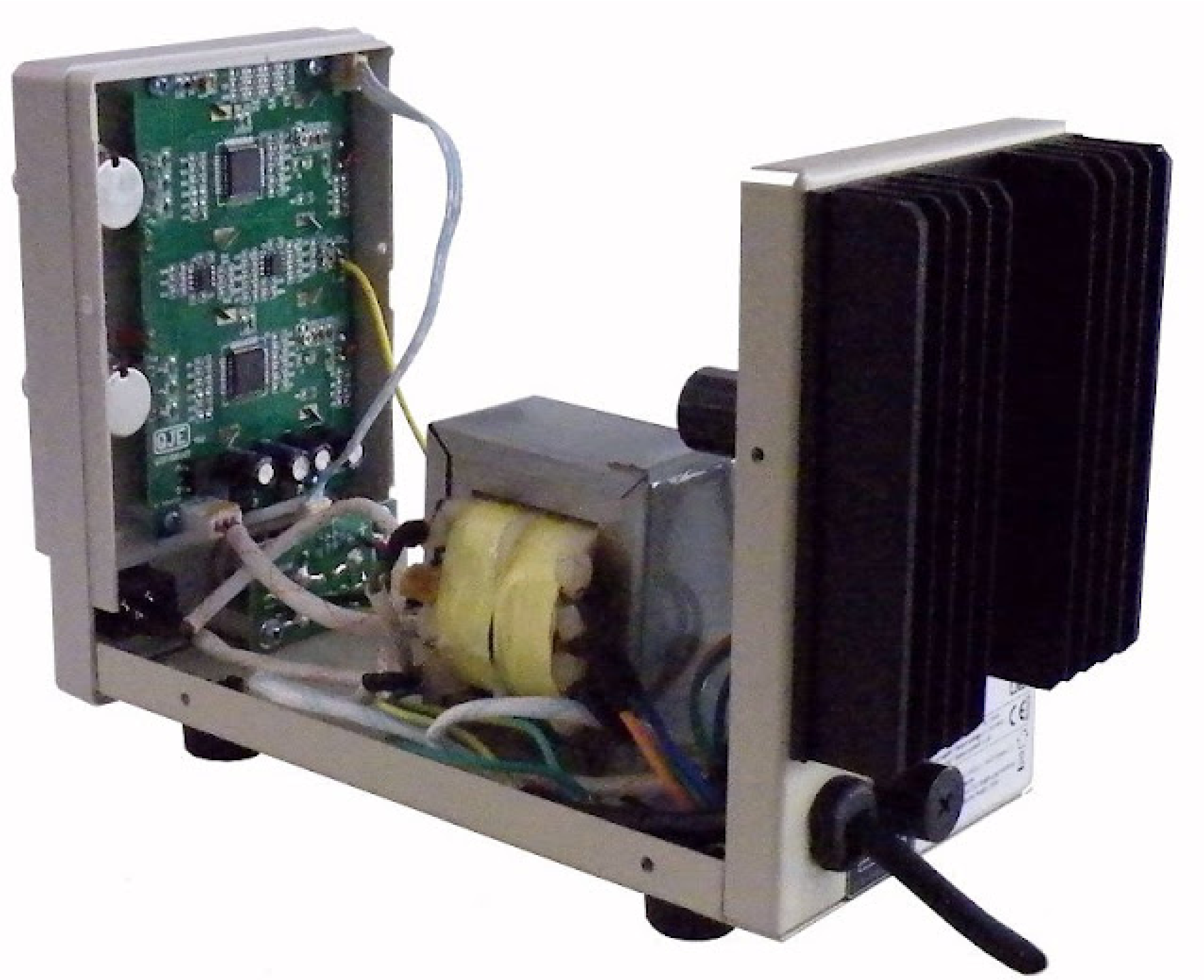
The specifications according to the manufacturer
According to the manufacturer, the GLPS1502C has the following technical specifications:

- **Input voltage:** 220 V_{ac} ą 10%
- **Output voltage:** 0 V_{dc} ~ 15.0 V_{dc}
- **Output current:** 0 A ~ 2.0 A
- **Output hum and noise:** less than 5 mV
- **Voltage regulation:** better than 10^{-4} ą3 mV
- **Current regulation:** better than 10^{-3} ą6 mA
- **Voltage meter accuracy:** 1 % ą1 digit
- **Current meter accuracy:** 1 % ą1 digit

Opening the housing
The housing of this power supply consists of a U-shaped base on which the electronics are mounted and a U-shaped cover that is attached to the base with eight small screws. So it takes little effort to take a look at the electronics of this device. The amazingly small transformer is mounted on the base plate. Even more amazing is that this transformer has no less than four secondary windings. The circuits around the digital meters are apparently powered from completely separate supply voltages.
On the back there is a PCB on which the rectifier, smoothing capacitor and stabilization electronics are mounted. This board is screwed directly onto the heatsink. On this PCB is a relay, which offers two different transformer voltages to the rectifier (*read further*).
Behind the front is a large PCB that contains the electronics of the two digital meters and the control electronics for setting the constant voltage or constant current. The two output connectors are mounted on a small third PCB, which also contains the current sensor resistor.



The interior of the GLPS1502C seen from the front.



The interior of the GLPS1502C seen from the rear.

Although the wiring has been installed rather sloppily in the interior of the device, details still show that the manufacturer did not make it a rush job. Solder connections are insulated with heatshrink tubing, all PCB connectors are fixed with a drop of glue and all wires carrying the mains voltage are additionally insulated with pieces of tubing. Even the primary smoothing capacitor of 3,300 ĩF is glued to the PCB.

The two LCD's are controlled by Chinese clones of the well-known Intersil digital voltmeter chip ICL7106. The two meters measure the real output voltage and the real output current provided by the power supply.

Under the rear PCB, a TIP3055 transistor is screwed to the heatsink. This transistor is mounted isolated, the heatsink is voltage-free.

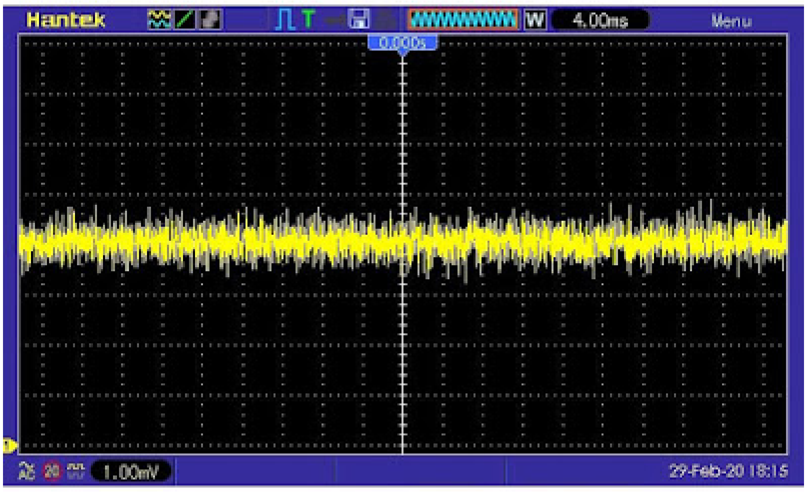
The output PCB

The two output connectors are not mounted on the front panel, but on a small third PCB, see the picture below. On this circuit board there are also a few parts, like the output filter, the reverse diode between the output terminals and a wirewound resistor that is probably the current sensor. The two connectors are not screwed to this circuit board, but soldered. We don't think this is the best solution. After all, when plugging in banana plugs, a lot of force is applied to the connectors, and that does not seem to be beneficial for the solder connections.



The output PCB with the two 4 mm connectors.

The ripple and noise on the output voltage
In the introduction we wrote *'The linear control has the advantage that there is a (in theory) absolutely pure DC voltage on the output.*, with the emphasis on *'in theory*'. In practice you will also measure some unwanted signals at the output voltage of a linear power supply. In the first place ripple, a remnant of the 50 Hz AC voltage with which you power the device. Secondly, noise, because every electronic circuit generates noise.
The GLPS1502C performs very well. In the oscillogram below you can see the ripple and noise on the output voltage of 5.00 V with a load of 2.0 A. Note the sensitivity setting of the oscilloscope: 1 mV/div! There is no ripple at all on the output voltage, only a very small noise voltage. Measured with our Philips PM2454 AC millivoltmeter with a bandwidth of 2 MHz, our test device provides 0.42 mV_{rms} noise at 5.00 V output voltage and 0.95 mV_{rms} noise at 15.0 V output voltage. Note that both voltages were measured at the maximum load with 2.00 A.



The ripple and noise on the output at 2.00 A load.